10.3.2 User Newsletter

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This is the tenth issue of the user newsletter for 10.3.2. It's been almost a year since the ninth, so it's high time for another issue.

Publications

Publications continue to flow nicely. We had our first PNAS (Webb, S. M., Dick, G. J., Bargar, J. R., Tebo, B. M. (2005) "Evidence for the presence of Mn(III) intermediates in the bacterial oxidation of Mn(II)", *Proc. Nat. Acad. Sci.*, **102**, 5558-5563). We have several more publications in the pipeline, some in high-value journals.

Branching out

We continue to branch out into fields other than environmental. We have a proposal on watching nanoparticle reactions in micro-reactors, one on metals in eye-lenses, and one on materials from space, which we hope to parley into a study of samples from the Genesis probe.

Two ongoing nanoparticle projects are wrapping up now, one of which is at the stage of final data analysis, and the other at initial data analysis and wrap-up data gathering. In the course of the latter project, we have taken S EXAFS for the first time.

Changes

The space changes I mentioned last year, caused by PEEM3, have been completed. Thus, we have a sliding door and fewer cabinets than we used to. The LN2

drop discussed last time is a reality. We never have to worry about whether the detector will run dry over a long weekend! Sirine bought a new table for sample prep. We now have a pretty good set of tools for working with samples, including a pellet press.

The XRD detector situation appears to be stable, as we've kept the SMART 6000 for the better part of a year without anyone claiming it..

EXAFS at the S edge, as well as mapping of Si and routine Cl XANES, have been made possible by a new device which excludes air from almost all of the region between the I_0 chamber, sample and detector. This device is a tube which fits over the end of the detector snout. The other end is cut at a 45^o angle and covered with polypropylene film. This surface comes as close to the sample as possible and is parallel to the scan direction of the stage. There is also a window which lets in the incident beam. This tube is filled with He from the exit pipe of the I_0 chamber. We now use this air excluder exclusively instead of beam-bagging, which never worked very well and was quite painful.

There have been many incremental changes in the analysis and data-collection codes. The EXAFS code provides the ability to make the cursor on the I_0 display track that on the spectrum or vice versa. This is handy for seeing whether a feature is a glitch or real. The XY map code allows masking in real space as well as scatterplot space. It also has separate gamma controls for R,G and B in the tricolor map. In addition, the program provides tools for doing lineout plots, measuring average intensities in areas, and measuring the relative contributions of hotspots vs. low-intensity backgrounds. This feature is useful in figuring out how representative of the total metal content of the sample the bright areas actually are. There is a new version of the map-registration program which allows one to compensate for sample movement during a scan. This has

long been a problem, especially when doing difference or chemical maps. Things came to a head when a user spent an entire day mapping a single area in various energies only to find the maps badly sheared by sample motion.

The executables on the beamline website have been updated to match what's on the desktop of the data-analysis computer. I took away the source-code link because keeping that updated is a much bigger chore. If anyone wants source code, I will provide it; just ask. Most of the manuals have been updated, including the operations manual. No more is there a beamline description document talking about white beam, which hasn't been available for years. Some documents related to the detailed running of the beamline have been removed on the grounds that there's little need for a cheat-sheet on tuning M1 if you're not here to tune it.

The posters on the back wall have been updated for the Montano Committee review in February. In addition, we have an 'interactive poster' to which some users have contributed. This is a PowerPoint presentation which exists on a dedicated computer with a flatscreen monitor on the downstream end of the 10.3.1 hutch. It now uses a wireless mouse, but will soon be converted to a touchscreen. Most, if not all of the beamlines around the ring now have these. A copy of this presentation exists on the beamline website.

Where's the flux?

In the last newsletter, I said that our flux was off by a factor of 3. Actually, new measurements and new calculations by James Glossinger showed that we're only out by 1.5x. The new element in the calculation is the effect of source size on the overfilling of

the mirrors, which hadn't been taken into account. The remaining discrepancy is spectrally uniform within a wide band, thus ruling out the idea of an absorber in the way. Other tests rule out such things as the front-end mask being in the wrong place and the crystals having bad spots.

Low-energy upgrade

The workshop mentioned last year was well-attended and became the basis for our decision about extending the energy range. Last year, what was on the table included a low-energy-capable monochromator and a new superbend beamline for high energies. The interest shown at the workshop in the high energies was so lackluster as to pretty much remove any driving force towards a high-energy upgrade. This was partly because the people involved in actinide research were off at their own workshop that day. However, there was some interest in the much cheaper low-energy path. Thus, we are starting design work on a new monochromator which will allow us to switch easily between Si, InSb and a third crystal to be named later, possibly YB_{66}. The thermal properties of InSb are so poor that the mono will require cryocooling. However, a cryocooled mono is being designed for another beamline and it should be possible to take advantage of some of the design. The new mono will allow us to go down to the Si edge. Also, it may provide better performance even at the S edge because the change of Bragg angle over an EXAFS scan won't be as great as with Si. It is curious that there is only one natural element for which no beamline on the ring can do EXAFS, and that's P, which will become accessible with the new mono. It has yet to be determined whether this

monochromator is feasible with the money we have. If it is, we will target it for next year's shutdown.

Note added May 4, 2005: For monetary and other reasons, the new mono has been put on hold for this year. It will share design elements with one being designed for the femtosecond project, so some of the work will be done on that project's money.

Thanks!

A big *thank you!* to all the users who responded to my incessant requests for information and presentation materials during this time of reviews and the User-meeting workshop. As often seems to happen, several opportunities for communication with the Powers That Be occurred over a short period. In addition to the workshop, users responded brilliantly to my request for posters at the user meeting, to the extent that there were 9 10.3.2-related posters hanging. Too bad the rain washed out the end of the poster session.